Amendments to the Specification:

Please add the following seven new paragraphs before the paragraph beginning on page 6, line 4:

The present invention is directed to a microfluidic device for providing a concentration gradient, comprising a microfluidic channel having a first and second inlet and a first outlet, a first fluid comprising a diffusible constituent flowing through said first inlet into said channel, and a second fluid flowing through said second inlet into said channel such that said first fluid flows in parallel with said second fluid in at least a portion of said channel, thereby providing a diffusion interface between said first and said second fluid and said diffusible constituent diffuses from said first fluid into said second fluid such that the concentration of diffusible species varies along the longitudinal axis of said diffusion interface.

In a further embodiment, said second fluid comprises particles that interact with said diffusible constituent of said first fluid such that the interaction creates a measurable effect that is different for different concentrations of diffusible species.

In yet a further embodiment, the device further comprises a third fluid inlet to said channel and a third fluid also comprising diffusible constituents entering said channel through said third inlet such that said first and third fluids, surround said second fluid on two sides and diffusible constituents diffuse into said second fluid, thus diluting said second fluid such that the concentration of said second fluid is gradually decreased with distance from a section of said channel where said first and second fluids contact one another. Said first and third fluids may be introduced through said first and third inlet from a common inlet.

In more specific embodiments, (i) the rate of flow of said first fluid and said second fluid remain constant, (ii) the rate of flow of said first fluid varies with respect to the rate of flow of said second fluid, (iii) said diffusible constituent consists of a soluble compound, (iv) said particles consist of molecules, such as proteins, and/or (v) said particles consist of large undissolved particles, such as microbeads.

The present invention is also directed to a microfluidic device for exposing particles to a concentration gradient comprising a first inlet and a first solution, a second inlet and a second solution also comprising a first soluble compound, a first channel, attached to said

first and second inlets, with said first and second solutions flowing in parallel with each other through said first channel, thereby mixing by diffusion and thus forming a stream having a gradient of concentration along the longitudinal axis of said first channel, and a third inlet, located downstream from said first and second inlets and a third solution flowing within said third inlet containing particulate matter such that said third solution and said stream flow in parallel in the portion of said channel located downstream from said third inlet, whereby exposing said particulate matter to a concentration gradient.

In a further embodiment, the device further comprises sensing means for measuring a reaction between said stream and said particulate matter in said third solution and, in more specific embodiments, said particulate matter comprises a biological material, which may consist of cells or proteins.

In yet further embodiments, a plurality of said microfluidic devices are located on a single chip and said devices further comprise a measurement region for measuring the difference in a response within said devices on said chip.